Amendments to the Claims

1. (Currently Amended) A differential oscillator comprising:

a first transistor having first and second end terminals and a first control terminal;

a second transistor having third and fourth end terminals and a second control terminal;

means for coupling the first control terminal to one of the end terminals of the second transistor and the second control terminal to the corresponding end terminal of the first transistor;

means for biasing the first and second transistors to oscillate;

a differential output formed between corresponding end terminals of the first and second transistors; and

a reference crystal connected across the differential output to establish ~~the~~ a frequency across the differential output.

2. (Currently Amended) The differential oscillator of claim 1, in which the differential oscillator is part of an integrated circuit chip, the differential output of the differential oscillator is coupled to external terminals on the integrated circuit chip, the reference crystal is disposed off the integrated circuit chip, and the reference crystal is connected to the external terminals.

3. (Currently Amended) The differential oscillator of claim 1, in which the coupling means comprises a first RC timing circuit connected between the first control terminal and the end terminal of the second transistor and a second RC timing circuit connected between the second control terminal and the one end terminal of the first transistor, the RC timing circuits determining ~~the~~ a natural frequency at which the differential oscillator oscillates in ~~the~~ an absence of the reference crystal ~~reference~~.

4. (Original) The differential oscillator of claim 1, additionally comprising a buffer amplifier having a differential input connected across the differential output.

5. (Currently Amended) The differential oscillator of claim 1, in which the <u>reference</u> crystal ~~reference~~ is a quartz crystal.

6. (Currently Amended) A crystal oscillator including:

a resonator circuit, defining a symmetrical pair of output terminals;

an active oscillator circuit, coupled to the ~~resonator circuit~~ <u>symmetrical pair of</u> output terminals, thus creating differential sinusoidal signals of substantially ~~the~~ <u>a</u> same amplitude at the symmetrical pair of ~~resonator circuit~~ output terminals; and

a linear buffer amplifier, coupled to receive the differential sinusoidal signals thus created by the resonator circuit and <u>the</u> active oscillator circuit interaction, and providing a differential sinusoidal output signal at a pair of out put terminals.

7. (Currently Amended) The crystal oscillator of claim 6, further including:

a ~~non linear~~ <u>nonlinear</u> buffer amplifier, cascaded after the linear buffer amplifier such that the differential sinusoidal output signal is transformed into a differential periodic reference signal in operative response to the differential sinusoidal output signal from the linear buffer amplifier.

8. (Currently Amended) A crystal oscillator including:

a resonator circuit, defining a symmetrical pair of output terminals;

an active oscillator circuit, coupled to the ~~resonator circuit~~ <u>symmetrical pair of</u> output terminals, and thus creating differential sinusoidal signals at the symmetrical pair of output terminals;

a linear buffer amplifier, coupled to receive the differential sinusoidal signals thus created by an interaction between the resonator circuit and the active oscillator circuit ~~interaction~~, and providing a differential sinusoidal output signal at a pair of output terminals; and

a ~~non linear~~ nonlinear buffer amplifier, cascaded after the linear buffer amplifier such that the differential sinusoidal output signal is transformed into a differential periodic reference signal in operative response to the differential sinusoidal output signal from the linear buffer amplifier.

9. (Currently Amended) The crystal oscillator circuit of claim 8 wherein the resonator circuit comprises:

a crystal;

a first capacitor shunted to a ground from a first terminal of the crystal; and

a second capacitor shunted to the ground from a second terminal of the crystal.

10. (Currently Amended) The crystal oscillator circuit of claim 8 wherein the active oscillator circuit further comprises a differential pair of transistors implemented such that feed back in the active oscillator circuit limits a transistor gain thus preventing latch-up of ~~the~~ an active oscillator circuit output at frequencies above ~~the~~ cut off frequencies of ~~the~~ high pass filters.

11. (Currently Amended) The crystal oscillator circuit of claim 8 in which the active oscillator circuit comprises high pass filters in ~~the~~ a path of each ~~resonator lead~~ of the output terminals such that low frequencies are rejected thereby preventing latch up of ~~the~~ a crystal oscillator circuit output at frequencies below ~~the~~ cut off frequencies of the high pass filters.

12. (Currently Amended) The crystal oscillator circuit of claim 8 wherein the active oscillator circuit further comprises a gain device, providing positive feedback to the resonator circuit.

13. (Currently Amended) The crystal oscillator circuit claim 8 in which the active oscillator ~~stage~~ circuit comprises:

a first high pass filter in ~~the~~ a path of ~~the~~ a first ~~resonator~~ output terminal of the output terminals; and

a second high pass filter in ~~the~~ a path of ~~the~~ a second ~~resonator~~ output terminal of the output terminals;

whereby low frequencies are rejected, preventing latch up of ~~the~~ a circuit output at frequencies below ~~the~~ cut off frequencies of the first and the second high pass filters.

14. (Currently Amended) The crystal oscillator circuit claim 8 in which the linear buffer amplifier comprises:

means for presenting a high impedance at ~~the~~ an input of the resonator circuit thereby preventing resonator loading; and

bias means for operating the linear buffer amplifier in ~~the~~ a bias region producing linear amplification.

15. (Currently Amended) The crystal oscillator circuit claim 8 in which the linear buffer amplifier comprises means for producing a substantially unity signal gain.

16. (Currently Amended) The crystal oscillator circuit of claim 8 in which the linear buffer amplifier comprises means for producing a signal gain substantially within ~~the~~ a range of 0.95 to 1.05.

17. (Currently Amended) The crystal oscillator circuit of claim 8 wherein the nonlinear buffer amplifier comprises means for transforming a sine wave input to a square wave output, whereby an output jitter is reduced to produce a stable reference clock.

18. (Currently Amended) The crystal oscillator of claim 8 in which the nonlinear buffer amplifier comprises amplification means to transform a sine wave input to a CML square wave output.

19. (Currently Amended) A crystal oscillator circuit comprising:

a crystal resonator having differential outputs;

an active oscillator circuit having differential outputs cascaded with the crystal resonator such that the differential outputs produced by interactions between the crystal resonator and the active oscillator circuit ~~interactions~~ are sinusoidal signals;

a linear buffer amplifier having differential inputs coupled to ~~the~~ a point where the ~~cascaded~~ crystal resonator and the active oscillator circuit are connected, and thus providing a differential output without degrading the interactions between the crystal resonator and the active circuit ~~interaction~~; and

at least one nonlinear buffer amplifier having differential inputs coupled to the differential outputs of the linear buffer amplifier and producing a differential output signal.

20. (Currently Amendment) The crystal oscillator of claim 19 further comprising a ~~non linear~~ nonlinear buffer ~~amplifiers~~ amplifier coupled to ~~the~~ a linear buffer amplifier output.

21. (Currently Amended) A crystal oscillator circuit comprising:

a differential active network having differential output terminals;

a differential linear buffer amplifier having a differential input and output terminals;

a resonator coupled across the differential output terminals of the differential active network and the differential input to the differential linear buffer amplifier; and

at least one differential nonlinear buffer amplifier coupled to the output terminals of the differential linear buffer amplifier for producing one or more differential output signals.

22. (Currently Amended) The crystal oscillator circuit of claim 21 in which the resonator includes:

a crystal;

a first capacitor shunted to a ground from ~~the~~ a first terminal of the crystal; and

a second capacitor shunted to the ground from ~~the~~ a second terminal of the crystal.

23. (Currently Amended) The crystal oscillator circuit of claim 21 in which the differential active ~~oscillator circuit~~ network includes high pass filters in ~~the~~ a path of each ~~resonator~~ lead of the resonator such that low frequencies are rejected in order to prevent latch up of ~~the~~ a circuit output at frequencies below ~~the~~ cut off frequencies of the high pass filters.

24. (Currently Amended) The crystal oscillator of claim 21 in which the differential active ~~oscillator circuit~~ network additionally includes a differential pair of transistors implemented such that feed back in the ~~circuit~~ differential active network limits a transistor gain, thus preventing latch up of ~~the~~ a circuit output at frequencies above ~~the~~ cut off frequencies of ~~the~~ high pass filters.

25. (Currently Amended) The crystal oscillator of claim 21 in which the differential linear buffer amplifier comprises:

means to present a high input impedance to prevent resonator loading; and

bias means to operate the differential linear buffer amplifier in ~~the~~ an operating region of linear amplification.

26. (Currently Amended) The crystal oscillator of claim 21 in which the at least one differential nonlinear buffer amplifier comprises amplification means to transform a sine wave input to a square wave output.

27. (Currently Amended) The crystal oscillator of claim 21 in which the at least one differential nonlinear buffer amplifier comprises amplification means to transform a sine wave input to a CML square wave output.

28. (Currently Amended) A method for generating a stable differential clock signal comprising the steps of:

generating a differential sinusoidal signal across ~~the~~ terminals of a crystal;

high pass filtering ~~the~~ a signal present at each terminal of the crystal;

amplifying each signal that has been high pass filtered with a reduced gain as a signal amplitude increases;

buffering the differential sinusoidal signal that is present ~~at~~ across the terminals of the crystal;

linearly amplifying the buffered differential sinusoidal signal; and

nonlinearly amplifying the previously linearly amplified ~~buffer~~ buffered differential sinusoidal signal.

29. (Currently Amended) The method of claim 28 in which the nonlinearly amplifying step ~~of nonlinear amplification~~ produces an essentially square wave output.

30. (Currently Amended) A method for generating a stable differential clock signal comprising the steps of:

generating a differential sinusoidal signal across ~~the~~ terminals of a crystal;

linearly amplifying the differential sinusoidal signal; and

nonlinearly amplifying the linearly amplified differential sinusoidal signal, while maintaining a differential signal throughout and producing a differential output signal.

31. (Currently Amended) A crystal oscillator circuit comprising:

a one port resonator having two terminals to facilitate ~~the~~ an establishment of a differential sinusoidal signal between the terminals, that the differential sinusoidal signal is coupled to;

a one port active oscillator circuit having two terminals that are coupled to the one port resonator terminals whereby, ~~the~~ a resulting signal produced at the coupled terminals is a differential sinusoidal signal characterized by substantially equal amplitudes, and a phase difference of substantially one hundred and eighty degrees;

a first capacitor shunted to a ground from ~~the~~ a first terminal of the one port resonator;

a second capacitor shunted to the ground from ~~the~~ a second terminal of the one port resonator;

a two port buffer amplifier providing a high impedance differential input port and an output port, with each of the high impedance differential input port and the output port consisting of two terminals, having it's the high impedance differential input port coupled to ~~the~~ a coupling established between the one port resonator and the one port active oscillator circuit such that ~~the~~ a differential signal present is not perturbed, and having its output port coupled to; and

a two port nonlinear amplifier having differential inputs and outputs, with each of the differential inputs and outputs ~~port~~ consisting of ~~2~~ two terminals, with ~~its input port~~ the differential inputs coupled to the output port of the two port buffer amplifier wherein ~~the~~ an input is a differential sinusoid and ~~the~~ an output produced is a differential square wave of ~~the~~ a same frequency as the input, characterized by the substantially equal amplitudes, and ~~a~~ the phase difference of substantially one hundred and eighty degrees.

32. (Currently Amended) The crystal oscillator of claim 31 wherein additional nonlinear buffer amplifiers inputs are coupled to the ~~linear buffer amplifier's~~ output port of the two port buffer amplifier, wherein the input is a differential sinusoid and ~~the~~ outputs produced are differential square waves of the same frequency as the input, with each ~~nonlinear amplifier's~~ output of the

outputs characterized by the substantially equal amplitudes, and ~~a~~ the phase difference of substantially one hundred and eighty degrees between ~~the~~ pins.

33. (Currently amended) The crystal oscillator of claim 31, wherein ~~the~~ differential square wave amplitudes at ~~the~~ output ports of ~~the~~ additional nonlinear buffers are set to various differing logic levels.

34. (Withdrawn)

35. (Withdrawn)

36. (Withdrawn)

37. (Withdrawn)

38. (Withdrawn)

39. (Withdrawn)

40. (Withdrawn)

41. (Withdrawn)